

WHAT IS CLAIMED IS:

1. A rotational torque detection mechanism comprising:

a rotational shaft rotatably supported whose first end portion reaches
5 outside the mechanism;

a magnetostrictive membrane disposed on a surface of the rotational shaft and the membrane varying magnetic permeability thereof according to an amount and direction of rotational torque acting on the rotational shaft;

an excitation circuit which is disposed to confront the rotational shaft so
10 as to excite the magnetostrictive membrane; and

a detection circuit which is disposed to confront the rotational shaft so as to electrically detect a change of the magnetic permeability of the magnetostrictive membrane,

wherein the first end portion is adapted to be a free end and a second
15 end portion of the rotational shaft is rotatably supported.

2. A rotational torque detection mechanism according to claim1 further comprising an elastic member which is slidably disposed around the first end portion.

3. A rotational torque detection mechanism according to claim1 further comprising a bearing which is disposed around the first end portion with a predetermined gap distance.

4. A rotational torque detection mechanism according to claim 1 wherein a
25 thickness of the magnetostrictive membrane is adapted to be less than or

equal to 30 micron meters.

5. A rotational torque detection mechanism according to claim1 wherein Rockwell hardness of the rotational shaft is adapted to fall in a range between
5 equal to or greater than 40 and less than or equal to 65.

6. An electric power steering apparatus in which the rotational torque detection mechanism according to claim 1 is installed, wherein the apparatus provides assist torque according to an output signal of the mechanism.

10 7. An electric power steering apparatus according to claim 6 further comprising a shock absorber which relaxes impact force acting on the rotational torque detection mechanism.

15 8. A method for manufacturing a rotational torque detection mechanism which comprises a rotational shaft, a magnetostrictive membrane disposed on a surface of the rotational shaft, an excitation circuit for exciting the magnetostrictive membrane, and a detection circuit for electrically detecting a change of magnetic permeability of the magnetostrictive membrane, the
20 method comprising the steps of:

applying heat treatment to the rotational shaft so that Rockwell hardness thereof is adapted to fall in a range between equal to or greater than 40 and less than or equal to 65;

25 attaching the magnetostrictive membrane to the rotational shaft after the heat treatment; and

imposing anisotropy on the magnetostrictive membrane.